European specification equates to LMDS viability in the U.S. at 40 GHz. Several examples demonstrate that *European MVDS is not U.S. 40 GHz LMDS.*

As noted in Eurobell's February, 1994 franchise application, there are about 93,000 homes in the proposed franchise area. Of these, Eurobell plans to serve nearly 58,000 with a hybrid fiber/coaxial cable delivery system. Eurobell plans to serve over 16,000 with "regional" MVDS service not exceeding 32 channels derived from the cable plant. Finally, Eurobell plans to serve the remaining approximately 19,000 homes with "local" MVDS featuring a reduced service offering derived from separate head-end facilities. Note that Eurobell apparently has no confidence in serving more than about 20 percent of the homes with the one-way, programming-limited European MVDS with head end facilities separate from cable. Thus, MVDS is not a viable broadband alternative--it will offer only limited programming with one-way service and suffer from the frequency re-use inefficiency "built in" to the U.K. 40 GHz MVDS specification.

Other features of the Eurobell franchise application which the FSS parties choose not to reveal include the fact that the Eurobell application is for a "technologically neutral franchise license." This means that since the 40 GHz MVDS is unproven, Eurobell can retreat from its commitment to use MVDS to serve households and use a cable system. This flexibility was apparently recognized by the U.K. regulatory authority as necessary because 40 GHz MVDS is unproven even in Europe. The FSS interests attempt to create the impression that there are dozens of market entrants scrambling to employ the 40 GHz MVDS specification. This is simply not true.

Additionally, FSS parties have claimed that the Eurobell system will be *digital* as opposed to analog. This is false--the Eurobell system will be compliant with the MPT 1550 specification for *analog* MVDS. Eurobell has stated only its *intention* of expanding the system to "go digital" when appropriate technology is available. Eurobell's realistic view of the practicality of this in the near term has caused it to hedge. Further, FSS parties have claimed that the system will be interactive operationally in 1995. Any attempt to provide interactive services on the MVDS system architecture will further degrade its channel capacity from the already-non-competitive 32 channel limit for MVDS. Again, 40 GHz MVDS is not the frequency-efficient, interactive, competitive 28 GHz LMDS. Any attempt to point at the year-old Eurobell application to support any other view is simply misleading.

F. The European 40 GHz MVDS System is Not Transferable to the U.S. Market -- Summary

As set forth in CellularVision's comments on January 30, 1995 in the 40 GHz NPRM and further supported by the assessment of comments above, it is clear that the proposed 40 GHz European Multipoint Video Distribution System is not "transferable" to the United States from Europe, and is inferior to the American 28 GHz LMDS with regard to availability, cost, service flexibility, and interactive capability. Severe operational problems would result from any "translation" of the

28 GHz equipment to 40 GHz without accounting for differences which arise from the shift in frequency. These problems would arise independent of cost. The European 40 GHz MVDS specification is a "special case" applicable only to a small portion of the populated world due to the low rain-tolerance of the MVDS system architecture--it is not viable in the United States due to climate differences.

V. 28 GHZ LMDS SATISFIES AN ACUTE PUBLIC NEED NOT ADDRESSABLE BY 40 GHZ LMDS OR FIXED SATELLITE SERVICE--ALLOCATING THE 28 GHZ SPECTRUM TO FSS UPLINKS WOULD BE A WASTE OF THE VALUABLE SPECTRUM RESOURCE

The need for a cost-attractive, wireless, broadband, interactive alternative to cable and switched-broadband delivery systems is clear. LMDS satisfies this acute public need and in doing so offers a delivery mechanism which lends itself to real competition in the local loop for telephone, data, entertainment and interactive services. The fact that LMDS can provide these benefits to the public has been widely recognized by the Commission on numerous occasions as well as by commenters in the 28 GHz LMDS rule making and in the 40 GHz NPRM. From the standpoint of system capacity alone, the proposed FSS paper systems are incapable of even approaching the public-interest benefits of LMDS.

The fundamental FSS system capacity problems associated with the 28 GHz FSS paper proposals (Hughes, Teledesic) clearly indicate that to allocate the 28 GHz band to FSS uplinks exclusively would be an unfortunate waste of the public spectrum resource. This view is supported by the known proposed FSS systems' capacity limitations, and by the fact that LMDS is in service now, while FSS is years away (if the Hughes and Teledesic paper proposals are ever made real at all) and probably not possible until the twenty-first century.

A. There is Broad Agreement -- LMDS Serves the Public Interest

Pacific Bell Mobile Services and the Telesis Technologies Laboratory have asserted that "LMDS-type applications appear to have such public interest benefits as providing schools with access to the information age.." (Pacific Bell Mobile Services and Telesis Technologies Laboratory, p. 4).

Likewise, the Educational Parties have noted in their comments that "...there continues to be a need for cost-effective "last mile" technologies that can serve individual homes and businesses in a manner that provides sufficient capacity, flexibility and interactivity." (Educational Parties, p. 4) LMDS can provide all three attributes--capacity, flexibility, and interactivity. However, FSS cannot due to the inherent poor frequency reuse capability of satellite systems. It is interesting to note, as discussed elsewhere in this paper, that Teledesic suggests that high bandwidth, low error rates and low delay are desirable attributes of a communication system, but is silent on the issue of capacity. Teledesic's system capacity is its fatal flaw.

GE American Communications observes that satellites must "have the use of the necessary frequencies to satisfy anticipated customer demands for broadband services.." (GE American Communications, p. 2), and notes that such services can "most optimally be delivered by satellites operating in the 28 GHz band.." (GE American Communications, p. 3). Given the capacity limitations of satellite systems relative to LMDS, there is no way proposed FSS systems can satisfy customer demand--if the 28 GHz band is allocated exclusively to FSS, more than 90 percent of the populated world will be denied a wireless broadband alternative in favor of paper FSS system proposals with inferior capacity.

B. 28 GHz LMDS Means U.S. Jobs -- 40 GHz LMDS Does Not

Hewlett-Packard notes that "By the year 2000, we expect that 70% of the demand for information technology will come from outside the U.S., up from the present 62%. Right now, 88% of R&D jobs in the U.S. computer industry, and 70% of its manufacturing jobs are within the U.S." (Hewlett-Packard, p. 1) The United States must capitalize on the innovation of LMDS to grow exports and avoid export of jobs. Refocusing U.S. LMDS attention at 40 GHz will kill the U.S. market for LMDS since it is unviable in that band, and with the service market will go the domestic manufacturing base for LMDS. Since most of the populated world will deploy LMDS appropriately in the 28 GHz band, other countries will jump at 28 GHz LMDS and capitalize on the manufacturing and R&D opportunities that accompany this innovative technology.

GE American Communications appears to be equally concerned about spurning the current 28 GHz LMDS technology for the empty promise of 40 GHz LMDS, as it has noted "If the Commission places its hopes on the possibility that some undefined future technologies will make use of the 40 GHz band, then it will compromise the needs in the 28 GHz band that have been demonstrated to exist today." (GE American Communications, p. 6) LMDS potential at 40 GHz represents a fundamentally unviable "future technology," while the viability of satellite uplinks above 40 GHz are proven today with the MILSTAR system and its 44 GHz uplinks as discussed in CellularVision's January 30, 1995 comments in this proceeding and below.

C. 28 GHz LMDS is Critical to the Deployment of the National Information Infrastructure

GE American Communications further supports delivery of "...the broadband services of the NII in the shortest possible amount of time" (GE American Communications, p. 9). Such services are deliverable today with LMDS, while proposed FSS systems are years away and of such limited capacity that the "have-nots" would far outnumber the "haves" with FSS technology.

To justify the move of LMDS to the bands above 40 GHz and the allocation of the 28 GHz band to proposed FSS systems, NASA comments that "...ACTS directly benefits the constituency of the FCC: American Industry and the American public."

(NASA, pp. i-ii) In fact, as the above comments so clearly illustrate, a prudent decision weighing *all factors* is what will benefit the public--this does not necessarily indicate a decision that will glorify the 28 GHz FSS legacy of ACTS. NASA and FSS interests, who consist of a few well-financed corporate giants, would be beneficiaries of such a decision, but benefits would not necessarily accrue to the American Public which would be better served by allocating the 28 GHz band to LMDS.

In the same manner as NASA, Teledesic creates a slanted, distorted view of "the public interest" as it claims it supports the "orderly development and deployment of terrestrial LMDS for the benefit of the citizens of the United States" (Teledesic, p. 2) by moving LMDS to the bands above 40 GHz. If Teledesic really supports the "benefit of the citizens of the United States," then it must support the only action that will ensure that the citizens will benefit--further deployment of LMDS in the currently-licensed LMDS band at 28 GHz and either deployment of the "ubiquitous" Teledesic terminals at 28 GHz under a co-frequency sharing approach with LMDS--at 28 GHz *outside* LMDS service areas--or anywhere in the bands above 40 GHz which are attractive for FSS as evidenced by the MILSTAR experience.

D. Only 28 GHz LMDS Satisfies FSS Interests' Stated Desire for Quick Rollout of LMDS

GE American Communications has claimed that with interference-free spectrum at 40 GHz and above, "LMDS operators can roll out their services in the shortest possible period and begin to compete in the marketplace." (GE American Communications, p. 6). Immediate roll-out is obviously supported by LMDS at 28 GHz since it exists today. To deploy at 40 GHz would take years and would be absolutely unviable *economically* independent of any deployment timeframe. As Pacific Bell has noted, "*Equipment that operates at these frequencies is virtually nonexistent or prohibitively expensive.*" (emphasis added; Pacific Bell Mobile Services and Telesis Technologies Laboratory, p. 4).

E. Teledesic's Poor Capacity Would Waste the Precious 28 GHz Spectrum Resource--Contrary to the Public Interest

Teledesic alternately refers to its system capability to provide broadband services to "all the world's citizens" and to provide services to the underserved "rural and remote parts" of the world. (Teledesic, p. i). Teledesic *cannot* provide service to even a significant fraction of the rural and remote population, let alone all the world's citizens. Its capacity is limited to 2 million simultaneous 16 kb/s service links or 20,000 T1 service links. This would not be enough capacity to serve even one percent of "the world's citizens." Given this, it is preposterous that Teledesic would argue that it offers a better use of the public spectrum resource than LMDS, which could offer the same capacity in the same spectrum in a single metropolitan area anywhere in the world, and reuse the same spectrum thousands of times over at less than the cost of the Teledesic system. Thus the "vast untapped potential" of Teledesic (by its own characterization) is an insignificant fraction of the potential

of 28 GHz LMDS to serve the world with cost-efficient broadband communications.

If the Teledesic system's capacity was consumed in the "overcrowded, overburdened urban congregations" (Teledesic, p. ii), there would be no capacity left to serve rural and remote areas, removing any rationale for the Teledesic concept--there will be less-expensive alternatives in cities. Service to the households not passed by cable in the New York PMSA alone (about 700,000) would consume over a third of the Teledesic capacity if it were possible to serve them with Teledesic service. Unfortunately, the self-limiting capacity of the Teledesic design would limit service to about 3,000 of these 700,000 households.

Thus, while the public benefits of LMDS deployment at 28 GHz are clear, the unattractiveness of the Teledesic proposal is equally clear. Yet the FSS proponents try to create the exact opposite impression. Teledesic represents that its paper FSS system would bring "vast social and economic benefits" while the purported benefits of LMDS are "insignificant" by comparison (Teledesic, p. ii). The "vast social and economic benefits" of the spectrum-wasteful, prohibitively expensive Teledesic system are not at all evident.

Teledesic observes that "over half the world's population lives more than two hours from a telephone" (Teledesic, p. 4). If this is true, then more than 2.5 billion people are in this predicament. What Teledesic does not say is that many of these people live in densely populated, underdeveloped areas that would be better served by LMDS than by Teledesic. One has to assume that Teledesic intends to serve this underserved population. Unfortunately, Teledesic's *total* system capacity would allow service to only 0.08 percent of this population. What about the other 99.92 percent of these 2.5 billion people who can't be served by Teledesic's $69 billion system? (p. 8, "Preliminary Technical Analysis of Potential FSS/LMDS Sharing Solutions and Observations on the Teledesic System Concept," Appendix C, Opposition to Motion for Leave to File Supplemental Comments, CellularVision of New York, L.P., December 15, 1994).

F. Hughes and Teledesic Lack the System Capacity to Be "Ubiquitous"

Claims have been made that moving LMDS to the 40 GHz band will resolve the interference conflict arising from deployment of ubiquitous LMDS terminals and *ubiquitous* interference-producing FSS earth stations in the same frequency bands (Hughes Communications Galaxy, p. 2). It is now clear, with the FSS parties' stated intentions to serve the "rural and underserved areas," that FSS terminals ***will not be ubiquitous***. If they were, the proposed FSS systems would use up the already poor capacity of the systems in the cities leaving little or nothing for their proposed service areas. This paradox exposes what appears to be the true motivation of the FSS parties -- to eliminate the competitive threat of LMDS.

G. Teledesic's Paper System Could Not Handle Even a Tiny Fraction of the World's Information Flow

Teledesic continues the misleading characterization of 28 GHz FSS capacity when it states that to "ensure seamless compatibility with the fiber and coaxial networks" the essential characteristics of a broadband satellite system "include high-bandwidth channels, low error rates and low delay." (Teledesic, p. 5). What Teledesic did not acknowledge is that fiber and coaxial networks (and LMDS systems) have all of these characteristics and *they also have high capacity*--the Teledesic system does not. It suffers from a pitifully low system capacity due to its self-limiting design. The total throughput of the proposed Teledesic system is approximately 32 Gb/s (this is 16 kb/s times 2 million). Within a few years, a single, solitary single-mode optical transmission system will be able to move this much traffic. If ever deployed, Teledesic simply would not be able to carry even a tiny fraction of the world's information flow immediately upon its deployment.

Because of Teledesic's design using "earth fixed cells," the system offers "coverage of every place on earth." (Teledesic, p. 6). Thus, capacity is directed to places where it is not needed and sufficient capacity is not directed to places where it is needed--and nothing can be done to rectify the problem. This flaw is a "bonus" on top of Teledesic's inherent spectrum-wasteful nature due to its poor frequency reuse capability. While the entire telecommunications community would like to "extend universal service" (Teledesic, p. 6) where possible, the low-capacity Teledesic solution is hardly an attractive choice.

H. MILSTAR Provides a 44 GHz Technology Legacy Ripe for FSS Commercialization

Martin Marietta observes that the 28 GHz band for satellite communications is attractive because corresponding spacecraft technology is within the current state of the art and because there is enough bandwidth to interconnect satellites and terrestrial fiber networks. (Martin Marietta Space Group, p. 2). It should be noted that the 40 GHz band offers both attributes--MILSTAR proves the necessary spacecraft technology exists and the 40.5 to 42.5 GHz bandwidth exceeds any realistic spectrum request for FSS at 28 GHz. Even an allocation of 2 GHz to a single FSS provider could not interconnect the fiber nets in just two cities--the fiber bandwidth is far too high. The best use of the 28 GHz band is for the "last mile" to individual subscribers exploiting a system architecture with high frequency re-use--this is LMDS.

GE American Communications also supports "immediate deployment of Ka-band satellites as soon as possible." (GE American Communications, p. 9) Which is it? Immediate? Or as soon as possible, which would mean the next millennium? FSS technology for commercial deployment at 28 GHz is years away. GE also claims it supports plans to "...expand delivery of the FSS services that are part of daily life for virtually every citizen..." (GE American Communications, p. 9) There are no FSS services that are part of the daily life for *virtually every citizen* except for

perhaps television programming feeders in other bands outside the 28 GHz band. The proposed 28 GHz FSS system's capacities will not allow the use or application by *virtually every citizen.*

I. The Only Win-win Situation: LMDS at 28 GHz

Teledesic and Hughes claim they wish to serve the "remote and underserved areas of the United States and other nations" (Rockwell International, p. 4). If this is the case, then there is no need to allow FSS service in the 28 GHz band in populated areas--LMDS is the better alternative in such areas. Alternatively, FSS uplinks could be operated at any location in the 40 GHz band, playing off of the proven-effective 44 GHz MILSTAR satellite technology. ACTS, the NASA system held up as the "prototype" of the Hughes and Teledesic FSS proposals, is still *experimental* today. Why not exploit the proven 44 GHz satellite technology which is *operational* today? The MILSTAR technology for satellite communications is more mature and cost-effective than any experimental 28 GHz FSS technology. 40 GHz FSS uplinks would truly be a win-win situation for LMDS and FSS.

J. 28 GHz LMDS Satisfies an Acute Public Need Not Addressable by 40 GHz LMDS or Fixed Satellite Service -- Allocating the 28 GHz Spectrum to FSS Uplinks Would Be a Waste of the Valuable Spectrum Resource -- Summary

As can be seen by the review of public-benefit related comments above, LMDS is widely recognized as a much-needed wireless broadband alternative. Its cost will prohibit it from entering the marketplace in the U.S. at 40 GHz. Where LMDS opponents have attempted to address issues associated with the relative benefits of LMDS and FSS, they have been predictably silent about the shortcomings of FSS or have made statements which, when considered objectively and not in the distorted context created by the FSS interests, support the view that LMDS offers the most attractive benefits derivable from use of the valuable 28 GHz spectrum resource.

It is clear that fundamental FSS system capacity problems associated with the 28 GHz FSS paper proposals indicate that to allocate the 28 GHz band exclusively to FSS uplinks would be an unfortunate waste of the public spectrum resource. Given the FSS capacity limitations and that the goals of FSS and LMDS are complimentary, with LMDS in dense, populous areas and FSS desired in "rural and underserved" areas, the potential exists for geographic mutual exclusivity as a solution should FSS proponents continue to refuse to work toward a co-frequency sharing solution in the 28 GHz band. This is especially compelling given that the 28 GHz LMDS is in commercial service now, while the proposed 28 GHz FSS is years away (if the Hughes and Teledesic paper proposals are ever made real at all) and probably not possible until the twenty-first century.

VI. THE 40 GHZ BAND IS PROVEN IDEAL FOR SATELLITE UPLINKS AND POINT-TO-POINT SYSTEMS BUT IS UNVIABLE FOR LMDS

FSS systems, already proven above 40 GHz, suffer from no degradation in moving from 28 GHz to the 40 GHz band. Additionally, point-to-point systems, which differ architecturally from LMDS as satellite systems do, are proven at frequencies close to those under consideration in the 40 GHz NPRM. Thus, while LMDS is not practical at 40 GHz and above at any cost, satellite and point-to-point terrestrial systems are proven to be practical above 40 GHz. The key reason for this is the system architecture differences between satellite, point-to-point and LMDS point-to-multipoint systems. The use of 40 GHz in the U.S. for LMDS would, in addition to its prohibitive cost and operational problems, require four times as much spectrum as LMDS at 28 GHz. Thus, LMDS is not a viable broadband communications alternative at 40 GHz.

A. FSS Uplinks are an Excellent Candidate for Use of the Bands Above 40 GHz

FSS uplinks, proven above 40 GHz, are excellent candidates for commercial application of the bands above 40 GHz consistent with the system designs of the paper Teledesic and Hughes proposals. GE American Communications presents a distorted view when it notes that while LMDS is viable in the 40 GHz band (a position which is simply wrong), "... this is in contrast to sub optimal use of the 40 GHz band for satellites" with "transmission paths through hundreds or thousands of miles through the atmosphere" (GE American Communications, p. 7). GE seems to have overlooked that fact that there is broad consensus on the rain attenuation as the problem with LMDS at 40 GHz, and further seems to have conveniently forgotten that the satellite communications path through rain is only several miles, not "hundreds or thousands." Rain is restricted to the lower few miles of the atmosphere within which the temperature is above freezing. Compounding these misleading statements, GE then loses credibility completely when it claims limited spacecraft power as an issue, but fails to observe that the downlinks (which are affected by spacecraft power limitations--not the uplinks) for FSS under the scenario where 40 GHz is used for uplinks would be *precisely* where they are proposed for FSS with 28 GHz uplinks: in the 17-19 GHz band.

B. Satellite Uplinks are Not Severely Affected by Changes in Climate

The fact that 30/20 GHz satellite systems have been demonstrated as successful in Europe, North America, and Japan illustrates that satellite communications systems are much less sensitive to changes in propagation conditions between local areas than the terrestrial LMDS service. This, along with the fact that the 44/20 GHz MILSTAR system is suitable for deployment anywhere in the world (and is also insensitive to local climate differences), shows that FSS service uplinks in the 40 GHz band would be viable anywhere in the world.

C. NASA Correctly Cites Power Control and Excess Margins as Positive 40 GHz FSS Indicators

NASA points out that the "insignificant difference" in availability of the LMDS signal at 40 GHz as opposed to 28 GHz could be compensated for by power control at the hub. (NASA, p. 7). This is another statement made without a proper understanding of the LMDS system architecture, but which clearly applies to the promise of FSS uplinks above 40 GHz. Availability in the LMDS system becomes an acute problem at the edge of the cell in rain, even when the LMDS transmitter is exploiting ALL AVAILABLE POWER per channel. NASA's own analysis, although flawed in many other ways, takes account of all available LMDS transmitter power. One can only conclude that NASA is implying that adaptive power control on earth-space links, which have been proven to carry huge excess power margins under most conditions, can compensate for availability problems in *satellite* links at 40 GHz using power control--this is one point with which CellularVision would agree, and it underscores the viability of FSS above 40 GHz based on the proven U.S. MILSTAR 44 GHz technology and power margins anticipated in the paper FSS proposals.

D. Teledesic's Paper LEO System is Well-Suited for Operation Above 40 GHz

The view that 40 GHz FSS uplinks are supportable by current technology is apparent in the Teledesic comments, wherein Teledesic claims that its "low altitude also reduces signal loss and terminal power requirements." (Teledesic, p. ii). The low altitude is precisely why the paper Teledesic system has such large excess power margins--power margins that will easily allow it to operate its uplinks above 40 GHz as an alternative to the 28 GHz band where the commercial, deployed LMDS technology offers so much promise around the world. The proposed Teledesic system operates at a transmitter power level of -1.9 dBW in "heavy rain" conditions as described by Teledesic. This is 21 dB below the Teledesic stated maximum value of +19.1 dBW per carrier on the Teledesic "TSL" uplink. It is projected that for the heavy rain conditions at 41 GHz, the uplink would experience an additional 9.4 dB of rain attenuation above the value of rain loss at 28 GHz. Given that this is less than half of the excess uplink margin, Teledesic could operate at 41 GHz in heavy rain and *still* maintain a 11.6 dB margin on the uplink. Thus, by Teledesic's own estimation, it can operate with large margins at 41 GHz. This is due to the attractive relationship between system architecture in the satellite communications system and the effect of rain on a slant path to the satellite. This is contrasted with the unattractive effect on the increase in the number of transmitters needed in the terrestrial LMDS system due to a hypothetical move in frequency--as a result of its terrestrial system architecture and typical zero-degree elevation angle paths to subscribers.

E. The 40 GHz Band is Well-Suited for the Point-to-Point Service Architecture

In contrast to the architecture-driven unviability of operating LMDS above 40 GHz, point-to-point terrestrial interests have weighed in with their view that the bands

above 40 GHz are well-suited for point-to-point use. Avant-Garde has 38 GHz licenses in "the most populous areas of the U.S...", and given propagation similarity between 38 and 40, Avant-Garde can "confirm that commercial use of millimeter-wave transmission is practical." (Avant-Garde, p. 2) This confirms the view that, due to the fact that point-to-point links can exploit ultra-high-gain antennas at both ends of the link, point-to-point operations are practical in the 40 GHz band. LMDS, because of the need to serve multiple subscribers from a single transmission point, cannot exploit this method.

Further supporting the notion of point-to-point viability above 40 GHz, the TIA observes that "Given the short-haul, wideband characteristics of the frequencies above 40 GHz, this spectrum should be quite useful for the microwave backbone of emerging personal communications service ("PCS") and other wireless networks." (TIA, p. i). TIA also notes that "Microwave links to connect PCS microcells typically will be short distances." (TIA, p. 8).

GE American Communications confirms that point-to-point communications is practical above 40 GHz based on the Commission's observation that the 40 GHz band will "permit the development of short-range wireless radio systems..." (GE American Communications, p. 6).

F. LMDS Cellular Architecture is Rendered Unworkable by a Move to 40 GHz

GE American Communications creates a misleading picture regarding key architectural differences between LMDS, FSS and point-to-point service by observing that LMDS "...propagation characteristics are impacted slightly by signal attenuation caused by atmospheric conditions and particularly by rain" above 40 GHz (GE American Communications, p. 7). Since GE American Communications has not offered any objective analysis, it is unclear what is meant by "impacted slightly" or the "difference in attenuation characteristics is not major." (GE American Communications, p. 7). CellularVision presumes that in the absence of any analysis by GE and given GE's business focus on satellite communications it must be asserting that due to the slant paths associated with FSS operations there is little impact on FSS in moving from 28 GHz to 40 GHz or higher. GE further notes that the move in frequency could be accommodated by "inconsequential" changes to the system design. This is not true for LMDS, with its cellular architecture, but indeed is true for FSS, which has an earth station and space station regardless of the frequency operation, and suffers from no "multiplier" in the number of necessary system components for operations due to translation to the 40 GHz band.

G. 40 GHz LMDS Cannot Be the Needed Broadband Interactive Wireless "Last Mile"

The Educational Parties have expressed their view that LMWS as a "last mile" technology could be superior to anything else now available..." (Educational Parties, p. 4) due to the capacity and flexibility to tailor to particular geographic areas in a market. They further note that LMWS "appears to offer" the needed capability due to the multipoint and two-way capabilities of LMWS and the cellular design of LMWS. (Educational Parties, p. 4) These comments show that the Educational Parties recognize the capacity and flexibility of LMDS, but they do not recognize that its advantages will not be available if LMDS is forced to move to the bands above 40 GHz--the inability to support the desirable LMDS features of interactivity and capacity derived from frequency reuse in every cell would be the result even if cost was not an issue.

Hewlett-Packard has commented that the chief advantage of millimeter wave band is that the minimum 1 GHz of spectrum per licensee is a small percentage of the carrier frequency (Hewlett-Packard, p. 6). Unfortunately, even Hewlett-Packard has not recognized that the spectrum requirement will grow by a factor of four if LMDS is moved from 28 GHz to the bands above 40 GHz. As noted in the January 30, 1995 CellularVision comments, even the U.K. MVDS Working Group recognized that the spectral efficiency degrades by a factor of more than three for one-way video service alone. The addition of interactivity degrades the frequency reuse efficiency by the full factor of four. An alternative view is that the *capacity* of the LMDS system degrades by a factor of four when operating over a given spectral allocation at 40 GHz as opposed to 28 GHz.

H. 28 GHz FSS is a Paper Plan for the Next Millennium--40 GHz FSS Can Be Accommodated Today

Regarding the concept of time, Teledesic states that the 28 GHz band is "the only portion of the spectrum that *presently* can accommodate a global, interactive broadband satellite system." (Teledesic, p. 8, emphasis added) This is simply not true, as the 44 GHz MILSTAR success story illustrates. Moreover, Teledesic does not need to be accommodated *presently*. If authorized today, it could not become operational until well into the 21st century by Teledesic's own estimation. The "win-win situation for all affected parties" that Teledesic claims to support (Teledesic, p. 11) can be created only by continued deployment of LMDS in the technically-viable 28 GHz band and the operation of FSS uplinks either on a co-frequency basis in the 28 GHz band or in the bands above 40 GHz.

I. The 40 GHz Band is Proven Ideal for Satellite Uplinks and Point-to-Point Systems but is Unviable for LMDS -- Summary

It can be seen that FSS systems, already proven above 40 GHz, suffer from no system-architecture-induced degradation in moving from 28 GHz to the 40 GHz band. Additionally, point-to-point systems, which differ architecturally from LMDS as satellite systems do, are proven at frequencies close to those under consideration in the 40 GHz NPRM and advocated by point-to-point interests. Thus, while LMDS is not practical at 40 GHz and above at any cost, satellite and point-to-point terrestrial systems are proven to be practical above 40 GHz. The key reason for this is the system architecture differences between satellite, point-to-point and LMDS point-to-multipoint systems. The use of 40 GHz in the U.S. for LMDS would, in addition to its prohibitive cost and operational problems, require four times as much spectrum as LMDS at 28 GHz. Thus, LMDS is not a viable broadband communications alternative at 40 GHz.

Certificate of Service

I, Owen J. McGovern, hereby certify that the foregoing "Reply Comments" were delivered by hand on March 1, 1995 to the following:

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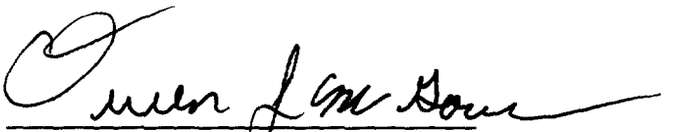

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